Viewmaster 80™

User's Manual

APPLIED ENGINEERING®

A DIVISION OF AE RESEARCH CORPORATION

v4.4

Applied Engineering

Telephone Numbers

Technical Support

(214) 241-6069

9 AM to 12:30 PM & 1:35 to 5 PM (CST)

Monday through Friday

Do not return any
product for service without a
Retum Material Authorization (RMA) number.
An RMA number can be obtained by calling Technical Support.

Sales

(214) 241-6060

9 AM to ll PM (CST) 7 days

Viewmaster 80™

User's Manual

Federal Communications Commission
Radio Frequency Interference Statement

The equipment described in this manual generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with these instructions, it may cause interference to radio or television reception.

FCC I.D. Number: EYW5QGVIEWMASTER

This equipment has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart I of Part 15 of the FCC Rules. These rules are designed to provide reasonable protection against radio and television interference in residential installation.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ❏ Reposition the receiver's antenna. Also make sure the antenna wires are making good electrical contact.
- ❏ Use a roof-mounted antenna rather than a "rabbit-ear" antenna or an antenna mounted in the attic.
- ❏ Make sure that all electrical connections on the computer are secure and any shielded I/O cables are properly fastened.
- ❏ Move the computer away from the receiver.
- ❏ Plug the computer and receiver into separate electrical circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Solve Radio-TV Interference Problems"

This booklet is available from the U.S. Govemment Printing Office, Washington, D.C, 240402, Stock No. 004-000-00345-4.

Warning: This equipment has been certified to comply with the limits for Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Applied Engineering® is not responsible for any radio or television interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

Limited Warranty & Disclaimer

Applied Engineering warrants the Viewmaster card against defects in material and workmanship for a period of 5 years from the date of original retail purchase. Applied Engineering also warrants that, under normal use, the magnetic media on which the included Æ software is stored is free from defects in materials and workmanship for a period of 30 days from the date of original purchase. Any misuse, abuse, or non authorized alteration, modification and/or repair to the Applied Engineering product will void the warranty. This warranty will also be void if you use the IE product for any other purpose than its intended use. If you discover a defect, Applied Engineering will, at its option, repair or replace only the Applied Engineering product, provided you return the product during the warranty period, transportation prepaid, to Applied Engineering.

This warranty applies to the original retail purchaser only, Therefore, please include a copy of the original invoice or a small service charge may be applied. If the product is to be sent to Applied Engineering by mail, the purchaser will insure the package or assume full responsibility for loss or damage during shipping. Prior to returning the product for warranty consideration, call Applied Engineering Technical Support for a Return Material Authorization (RMA) number and shipping instructions.

Even though Applied Engineering has tested the software and reviewed the documentation, Applied Engineering makes no warranty or representation, either express or implied, with respect to the manual or the software; their quality, performance, merchantability, or fitness for a particular purpose. As a result, the software and manual are sold "as is", and you, the purchaser, are assuming the entire risk as to their quality and performance.

In no event will Applied Engineering be liable for loss or damages of any kind caused either directly or indirectly by the use or possession of its products, even if advised of the possibility of such damages. The Applied Engineering Warranty is for the Applied Engineering Product itself. In particular, Applied Engineering shall have no liability for any other equipment used in conjunction with Applied Engineering products nor for programs or data stored in or used with Applied Engineering products, including the costs of recovering such equipment, programs, or data.

The warranty and remedies set forth above are exclusive and in lieu of all others, oral or written, express or implied. No Applied Engineering dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

This manual and the software (computer programs) described herein are copyrighted by Applied Engineering with all rights reserved. Under the copyright laws, this manual or the programs may not be copied, in whole or in part, without the written consent of Applied Engineering, except in the normal use of the software or to make an archival copy. This exception does not allow copies to be made for others, whether or not sold, but all of the materials purchased(with all archive copies) may be sold, loaned, or given to another person. Under the law, copying includes translating into another language or format. You may use this software on any computer owned by you but extra copies cannot be made for this purpose.

Applied Engineering cannot guarantee that you will receive notice of revisions to the software, documentation, or products described in this manual. Be sure to check with your dealer or Applied Engineering for information on possible updates. However, Applied Engineering reserves the right to make any improvements to Applied Engineering products without any responsibility toward upgrading previously released products.

Apple is a registered trademark of Apple Computer, Inc. AppleWorks, AppleWriter, DOS 3.3, and ProDOS are trademarks of Apple Computer, Inc.
Applied Engineering is a registered trademark of Applied Engineering. Viewmaster, Viewmaster 80, Z-80 Plus, and AW 2 Expander are trademarks of Applied Engineering.
Franklin Ace is a registered trademark of Franklin Computer Corporation. CP/M is a registered trademark of Digital Research, Inc. Videoterm is a trademark of Videx, inc. Microsoft and Softcard are trademarks of Microsoft Corporation. Radio Shack is a registered trademank of Tandy Corporation.

©Copyright 1988, Applied Engineering

Applied Engineering
P.O. Box 5100
Carrollton, Texas 75011
Sales: (214) 241-6060 9 AM - 11 PM (CST) 7 days
Technical Support: (214) 241-6069 9 AM - 12:30 & 1:35 - 5 PM (CST) Monday - Friday
(The Technical Support telephone lines cannot be accessed through the Sales department.)

Table Of Contents

INTRODUCTION - GETTING STARTED **iii**

About the Viewmaster 80 iii
System Requirements iii

CHAPTER ONE - INSTALLING THE VIEWMASTER 80 **1**

CHAPTER TWO - USING THE VIEWMASTER 80 **3**

Adjusting the Video Screen 3
Software Compatibility 4
In General... 4
CP/M Software 5
Pascal Software 5
Hardware Compatibility 5
What's Next... 6

CHAPTER THREE - SPECIAL KEYBOARD CHARACTERS **7**

Alternate Keyboard Characters 7
Lowercase Characters 8
Optional Shift Key Hardware Modification 8

APPENDICES **10**

A: Video Troubleshooting Guide 11
B: Automatic Graphics Override 13
C: For Programmers Only... 15
Activating the Viewmaster 80 from BASIC 15
Screen Editing Commands 15
Controlling the Display from Applesoft BASIC 16
Display Control Commands 17
Cursor Positioning 19
Custom Cursor Shape 19
Viewmaster 80 Graphics Display 20
Hardware Control of Viewmaster 80 21
40 Column Override 21
Light Pen Support 22

D: A Brief ProDOS Tutorial 23
Operating System 23
Naming Volumes 23
Root Directory and Subdirectory 23
Pathname 24
System Files 24
Additional Resources 25
E: Getting Help 26
Returning a Product 27
Include 27
When You Ship 28
When We Receive 28

INTRODUCTION

Getting Started

This chapter tells you a little about the Viewmaster 80™ and what you need to install it.

About the Viewmaster 80

The best way to describe the Viewmaster 80 is to list some of its many features:

- Super sharp 7 x 9 dot character matrix with true descenders
- Capable of both normal and inverse video character display
- Full 80 columns by 24 lines
- Fully compatible with all Apple® programming languages
- Highest compatibility with existing 80 column software
- Power and input connector for light pen
- Programmable cursor shape
- All Apple II on-screen editing commands supported
- Fully Videoterm™ compatible
- Compatible with both 60 and 50 Hertz power
- Very low power consumption (CMOS technology)
- High speed scroll rate (18 MegaHertz)
- Compatible with Apple][,][Plus and Franklin Ace® computers

System Requirements

Here's what you need to install your Viewmaster 80:

- An Apple][, Apple][Plus or Franklin Ace (1000 series) computer
- At least one disk drive
- A composite video monitor capable of 80 column display (NTSC composite video).

Most monochromatic computer monitors are capable of 80 column display. Most TV sets, on the other hand, are not. Televisions are only acceptable for programs which use a 40 column display. The narrower 80 column characters tend to blur and are very difficult to read when displayed on a TV screen.

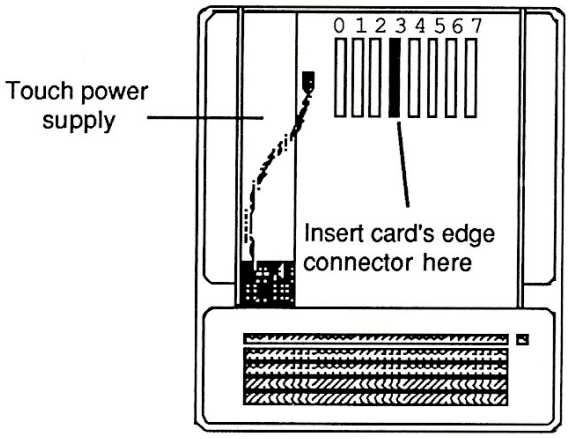
CHAPTER ONE

Installing the Viewmaster 80

Nothing complicated here. Just read these instructions carefully.

1. **Turn the computer power supply switch OFF**, but leave the computer plugged in (This provides an electrical path to discharge static electricity).
2. **Remove the computer's cover.**
3. **Discharge any static electricity** on your body or clothing by touching the metal case of the power supply. Go ahead, it won't hurt. And it is important! A static shock can seriously damage the chips on the Viewmaster and on the computer's motherboard as well.
4. **Remove the Viewmaster 80 from its anti-static bag.** Do not touch its gold edge connector.
5. **Line up the gold fingers of the edge connector with slot 3** then gently and firmly insert the connector into the slot by pressing down on the top of the card.

❖ *Note:* Expansion slot 3 in an Apple][, Apple][Plus, or Franklin Ace is fourth from the LEFT.



Inside the][and][+

6. **Connect one end of the short video cable, included with the Viewmaster 80, to the bottom video connector** on the Viewmaster 80 card.

7. **Route this cable out the back of the computer and connect the other end to the computer's video output connector.**
8. **Connect the video cable coming from your monitor to the top video connector** on the Viewmaster 80 card.
9. **Replace the cover.**
10. **Congratulations!** Installation is complete.

CHAPTER TWO

Using the Viewmaster

Adjusting the Video Screen

Once the Viewmaster 80 is installed in your computer, the monitor may need to be readjusted to provide the optimum 80 and 40 column displays.

Although many of the adjustments and controls are different on the various brands of monitors, they all basically do the same things. Read the owner's manual that came with your monitor to find out how to adjust the video display. If you're not sure what a particular adjustment knob adjusts, experiment. Turn it slightly in one direction. If it doesn't adjust what you want it to, return it to its original position. Adjusting a monitor is similar to adjusting a television set. But don't just start twisting knobs!

Here's basically what you need to do:

1. Turn the computer on. Boot your system disk. You should be in 40 column mode.
2. Perform the 40 column video adjustments (Brightness, Contrast, Focus, Vertical, and Horizontal adjustments).
   Adjust the brightness, contrast, and focus controls (if available) so that the characters are legible and clear and the background is dark. Too much brightness may cause the background "raster" lines to appear. Too much contrast or brightness may cause fuzzy characters. Too little contrast or brightness may result in dim characters.
   Use the horizontal controls to adjust the width of the display. Then use the vertical controls to adjust the height of the display.
3. While still in 40 column mode, enter the following video display program:

```
10 PRINT CHR$(12)
20 FOR J = 32 TO 127
30 PRINT CHR$(J);
40 NEXT J
50 C = C + 1
60 IF C = 17 THEN END
70 GOTO 20
```

4. Activate the 80 column mode and tune the 80 column video display.
   Activate the 80 column mode by entering `PR#3` and pressing Return. Type `RUN` to execute the video display program. The screen should fill with characters.
   lf necessary, readjust the display controls as you did for the 40 column mode in step 2.
5. Switch back to 40 column mode and recheck video alignment. Enter Control-Z and then 1 (Press the Z key while holding down the CTRL key then press 1). This is the command to deactivate the 80 column mode and return to 40 column display (The @ symbols on the screen are normal). `RUN` the program again. You may need to repeat steps 4 and 5 until the video display is acceptable in both 40 and 80 column modes.

Something not right? See the Video Troubleshooting Guide in Appendix A.

Software Compatibility

In General...

The Viewmaster 80 will support virtually all 80 column application software written for the Apple][or][Plus. Most software written specifically for 80 column display will usually activate the 80 column mode automatically or give you a menu option to select either 40 or 80 column display. Some earlier programs, however, were written before there was an established standard for interfacing with 80 column display cards. These programs may require a "preboot" program to activate the Viewmaster 80 and make the necessary modifications to enable the software to use the 80 column display.

Older versions of AppleWriter][and VisiCalc are examples of programs which may require a preboot disk to work properly with the Viewmaster 80 (or any 80 column card). Usually the publisher of the software will provide the preboot program or an updated program which will support the Viewmaster 80. Many useful programs for making earlier 40 column software compatible with 80 column cards are available in the public domain. Please check with the software publisher, your dealer, or local Apple user's group about preboot utilities or updates.

- Note: Most 40 column software does not automatically deactivate an 80 column card. If you try to run a 40 column program while the Viewmaster 80 is in 80 column mode, nothing will appear on the screen. Use the "Control-Z 1" command to deactivate the 80 column mode or boot your program disk using the computer's power switch.

CP/M® Software

Booting the CP/M operating system automatically initializes the Viewmaster 80. The Viewmaster 80 is compatible with both the Applied Engineering® Z-80 Plus™ card and the Microsoft® Softcard™. Other Z-80 processor cards which use a non-standard version of the CP/M operating system may not be completely compatible with Viewmaster 80.

Pascal Software

The Viewmaster 80 is fully compatible with Pascal and is automatically initialized whenever the Pascal operating system is booted.

The Escape codes used to generate the alternate characters not available on the Apple][Plus keyboard (described in Chapter 3) may interfere with Pascal. To overcome this, Applied Engineering has developed an enhanced console driver utility to enable the alternate characters to be entered from the Apple][Plus keyboard without conflicting with Pascal in any way. The Pascal Enhanced Console Driver utility disk is available from Applied Engineering Sales. The instructions are contained in a Pascal text file on the disk.

Hardware Compatibility

The Viewmaster 80 was designed to provide Apple][and Apple][Plus computers with 80 column display capability.

Most video monitors are compatible with Viewmaster 80's video output. A very small percentage of monitors may exhibit an annoying flickering when the 80 column display is active. The Apple Monitor ///, originally designed for the Apple /// computer, is one of these monitors. The screen flickering can be eliminated by the substitution of one of the ROM (Read Only Memory) chips on the Viewmaster 80 card. Please refer to Appendix A for details.

What's Next...

Now that you have successfully installed the Viewmaster 80 and adjusted the monitor to provide the optimum display in both 40 and 80 column modes, what you do next depends on how you wish to use your Viewmaster 80.

If you wish to modify AppleWorks to run on your Apple][Plus, refer to the AW 2 Expander Instructions manual.

Regardless of how you intend to use your Viewmaster 80, read Chapter 3. It covers some very important information about using Viewmaster 80's special characters.

CHAPTER THREE

Special Keyboard Characters

Many of the programs written for the Apple //e and //c use features not available on a standard Apple II Plus. This chapter deals with some of the differences between the earlier and the more recent Apple computers and how the Viewmaster 80 can emulate many of the display features of the //e and //c.

Alternate Keyboard Characters

The Apple][and Apple][Plus do not have many of the special character keys available on the Apple //e keyboard. The AW 2 Expander Instructions list some substitute keys you can use within AppleWorks. Some of these same keys can be used in other applications. The Viewmaster 80 is internally programmed to recognize certain unique keyboard command sequences, enabling it to display these special characters on the screen. The chart, below, shows the Apple //e keyboard characters and their equivalent Apple Il keystroke sequence. Since these characters are stored in Read Only Memory (ROM) on the Viewmaster 80 card, they are only available when the Viewmaster 80 is active (80 column mode).

Apple //e Keyboard	Apple ll Plus Equivalent
Tab	Control-I
Cursor Up	Control-K
Cursor Down	Control-]
Delete	Esc #
|	Esc !
_	Esc -
\	Esc /
[	Esc <
]	Esc >
{	Esc (
}	Esc)

You can get a reverse apostrophe by typing Esc ' (apostrophe). There is no reverse apostrophe on an Apple //e.

Lowercase Characters

When Viewmaster 80 is activated with a PR#3 from BASIC, it automatically enters uppercase mode. To toggle this shift lock feature between uppercase and lowercase, use Control-A (Press the A key while holding the CTRL key down). For this feature to work within a commercial application program, the program must support this lowercase display feature. Some application programs (e.g. AppleWriter][) use a different method to support upper and lowercase character display.

Optional Shift Key Hardware Modification

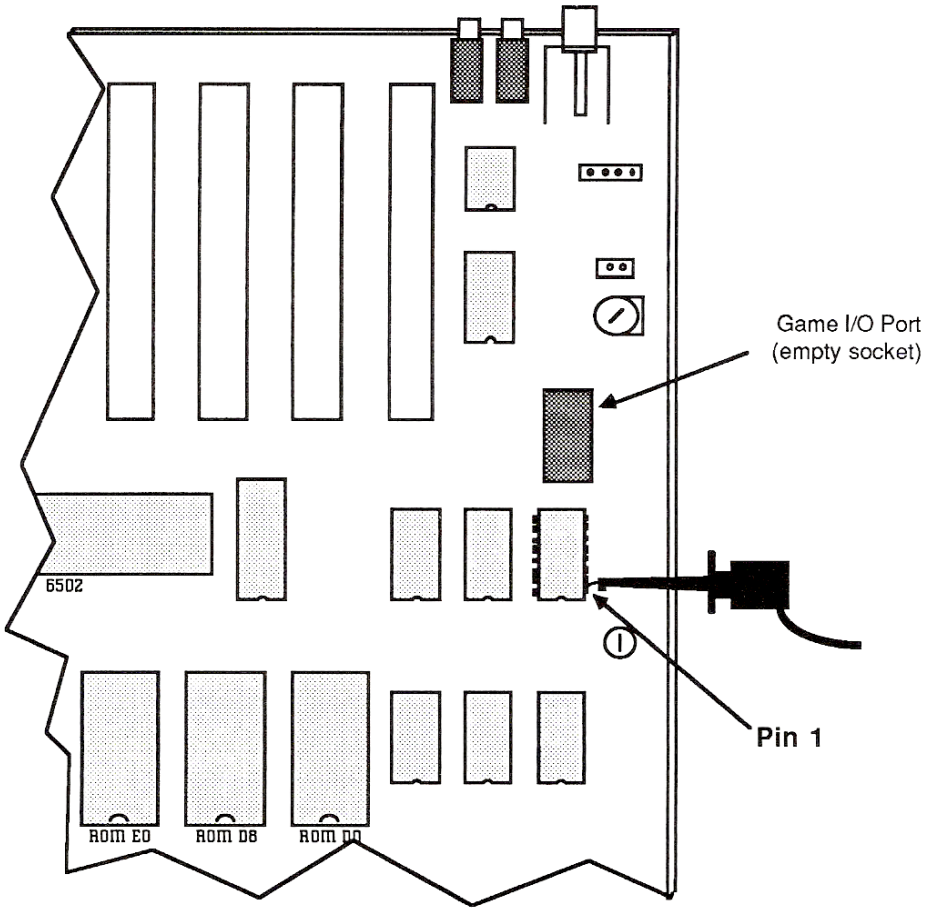
This is an easy to install, one-wire modification for the Apple][Plus which will enable you to use the lowercase feature of Viewmaster 80 and use the Shift key as a real shift key. If you are running an Applesoft BASIC program or AppleWorks, this relieves you of toggling Control-A every time you wish to change case (Control-A will still function as a shift-lock).

No cutting or soldering is required. The only part needed is readily available at your local Radio Shack® store. It is called a "Mini Clip Lead" and the part number is 278-016.

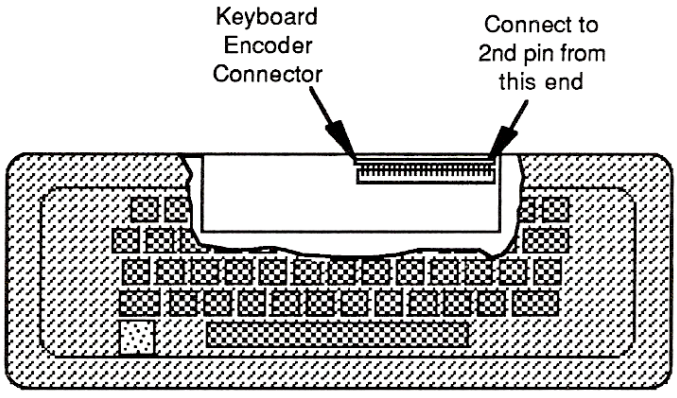
This modification requires a newer style keyboard used on **revision 7 or later** Apple][Plus computers. Contact your authorized Apple dealer for an upgrade to the latest revision main logic board & keyboard.

Here's how to apply the shift key modification to an Apple][Plus:

1. Turn the computer OFF and remove the cover.
2. Attach one of the lead's spring loaded clips to pin 1 of the 74LS251 integrated circuit "chip, " which is just forward of the Game I/O connector (toward the keyboard). See drawing following.
3. Connect the other end of the mini clip wire to pin 24 of the keyboard encoder connector. This connector is a row of 25 parallel wires extending between the keyboard and the keyboard encoder circuit card suspended below it. Pin 1 of this connector is nearest the power supply; pin 25 is nearest the right side of the computer (...pin 24 is second from the right).
4. Replace the cover; installation is complete.



Clip One End to Pin 1 of 74LS251



Clip Other End to Pin 24 of Encoder Connector

APPENDICES

The following appendices are included for further reference and reading enjoyment:

A -- Video Troubleshooting Guide

B -- Automatic Graphics Override

C -- For Programmers Only...

D -- A Brief ProDOS Tutorial

E -- Getting Help

APPENDIX A

Video Troubleshooting Guide

If you're having difficulty obtaining an acceptable video image, here's a list of video display symptoms and recommended solutions:

No Video

Check the simple things first; don't overlook the obvious. Is the computer plugged in? Is the monitor plugged in and turned on? Are the monitor and Viewmaster 80 video cables properly and securely connected? (See Chapter One). Is the monitor adjusted properly (eg. brightness, contrast, etc)? Is the Apple ll's video-level potentiometer, near the I/O Game port, turned fully clockwise? (See Figure B-3 on page 14)

Unstable Display

This problem is usually caused by an improperly adjusted monitor. Adjust the monitor's vertical and horizontal controls until you get an acceptable display. Also, check the troubleshooting guide in the monitor's owner's manual.

If you are experiencing a quivering display on an Apple Monitor ///, call Applied Engineering Technical Support! A special ROM chip for the Viewmaster 80, available from Applied Engineering, will eliminate this problem.

Weak 40 Column Display

This problem is usually associated with the video-level A potentiometer on the Apple ll main logic board. Make sure that it is adjusted to near-maximum output, fully clockwise (See Figure B-3 on page 14). Also check the cables and the video brightness and contrast controls on the monitor.

Unacceptable Screen Dimensions

Try adjusting the monitor's vertical and horizontal controls. If you turn any of the controls fully one direction or the other and still cannot achieve the desired result, you may need to take the monitor to a service technician who can adjust the video alignment controls inside the monitor. DO NOT remove the monitor's cover yourself! There are extremely high and dangerous voltages waiting inside!

No 80 Column Display

If you have an acceptable 40 column display, but no 80 column display when the Viewmaster 80 is activated (PR#3), first check to see that the Viewmaster 80 is actually installed in slot 3. Next, turn the computer off, remove the Viewmaster 80, verify that all of the integrated circuit "chips" on the card are securely seated, and reinstall it, making sure that it is fully seated in expansion slot 3.

APPENDIX B

Automatic Graphics Override

This is a one-wire modification which will enable the Viewmaster 80 to switch to graphics mode automatically when a graphics command is issued. The only part required is a "Mini-Clip Test Lead", available at your local Radio Shack store. The Radio Shack part number is 278-016 (This is the same part used for the Shift Key modification). No cutting or soldering is required. Here's all you have to do:

1. Turn the computer OFF and remove the computers cover.
2. If your Viewmaster has three resistors directly below the crystal, connect one of a Mini-Clip Test Lead's spring loaded hooks to the right side of the resistor immediately below the crystal on the Viewmaster 80 (See Figure B-1).
   If your Viewmaster has four resistors directly below the crystal, connect one of a Mini-Clip Test Lead's spring-loaded hooks to the right side of the second resistor below the crystal on the Viewmaster 80 (See Figure B-2).
3. Connect the other end of the Mini-Clip Test Lead to pin 4 of the 9334 chip at location F14 (See Figure B-3).
4. Replace the cover. That's all there is to it.

Figure B-1

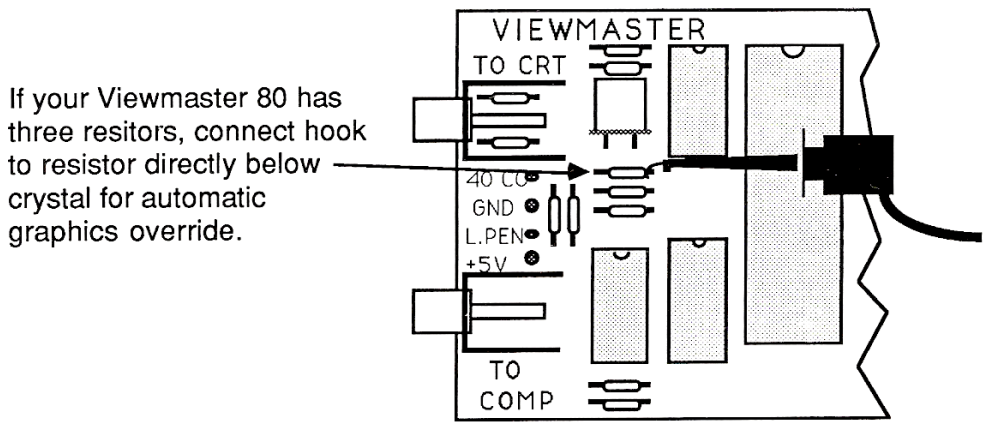


Figure B-2

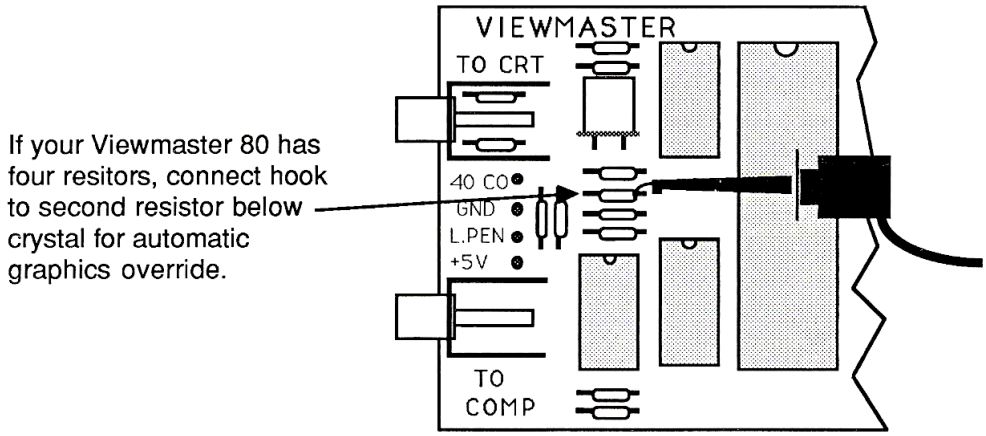
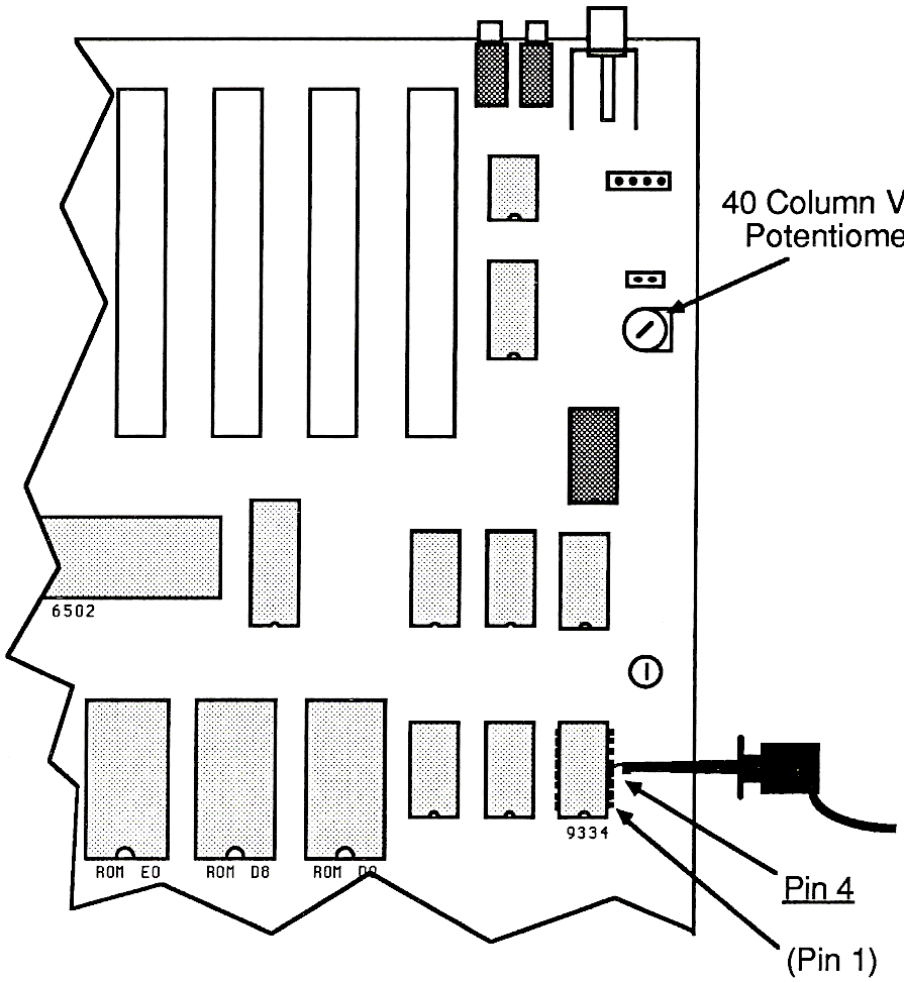


Figure B-3



APPENDIX C

For Programmers Only...

Application programs, written for 80 column display, will automatically activate the Viewmaster 80 and its operation will be completely transparent to the user. If you're a programmer and want to control the Viewmaster 80 features from within your own program, this appendix contains the information you will need. You don't have to be an experienced programmer, but you should be familiar with the Applesoft BASIC programming language and the operating system you will be using, either DOS or ProDOS.

Activating the Viewmaster 80 from BASIC

To activate, or initialize, the Viewmaster 80 directly from the keyboard (immediate mode), enter PR#3 at the Applesoft BASIC ( ]) prompt. Once either DOS 3.3 or ProDOS has been loaded into memory, the Viewmaster 80 can be activated from within a BASIC program (deferred mode). This is accomplished through this program statement:

```
10 PRINT CHR$(4);"PR#3"
```

The command to deactivate the Viewmaster 80 is a "Control-Z" followed by a "1". From the immediate (keyboard) mode this would be entered as: "Control-Z 1". From the deferred (program) mode:

```
10 PRINT CHR$(26); CHR$(49)
```

This will disable the Viewmaster 80's 80 column display and return to the Apple-generated 40 column display. The inverse @ symbols displayed on the screen when the Viewmaster 80 is deactivated are normal. Issuing the HOME command after deactivating the Viewmaster 80 will clear the 40 column screen and home the cursor.

Screen Editing Commands

Pressing the Escape key while programming in Applesoft BASIC will put the computer into an "altered state" called the Escape mode. While in the Escape mode, some keys define special editing functions.

Some keys will execute a certain function then exit the Escape mode; other keys allow the Escape mode to remain active until canceled by the user. The Escape mode provides control of the Apple video display and allows you to edit BASIC program statements. For a more detailed explanation of the editing features please refer to the Applesoft BASIC Programmer's Reference Manual.

The Escape codes recognized by the Viewmaster 80 are the same as the ones used to edit the Apple's 40 column mode display. For your convenience, these Escape codes are summarized in Table C-1.

Table C-1 Escape Codes

Escape Sequence	Function	Notes
Esc @	Clears screen and homes cursor	*
Esc A	Moves cursor right one space	*
Esc B	Moves cursor left one space	*
Esc C	Moves the cursor down on line	*
Esc D	Moves the cursor up one line	*
Esc E	Clears from cursor to end of line	*
Esc F	Clears from cursor to bottom of screen	**
Esc I	Moves the cursor up one line	**
Esc J or left arrow	Moves the cursor left one space	**
Esc K or right arrow	Moves the cursor right one space	**
Esc M	Moves the cursor down one line	**

* These keys perform their function, then exit the Escape Mode.

** These keys perform their functions and remain in the Escape Mode. The suggested method for exiting Escape mode is to press the SPACE bar once.

Controlling the Display from Applesoft BASIC

When programming in Applesoft BASIC, some Viewmaster 80 features can be accessed by using control codes. These codes are actually invisible ASCII characters which have a special meaning to the computer and Viewmaster 80 (ASCII is an acronym for American Standard Code for Information Interchange). Control codes are entered by holding the CTRL key down while pressing another character key. Another way to issue a control code is from within a BASIC program. Please refer to the Applesoft BASIC Programmers Reference Manual for more details on control codes and their uses.

Table C-2 presents a summary of control codes and their functions. Note that some codes can be entered both from the keyboard and from within a program.

Table C-2 Control Codes

Control Character	Decimal Code	Function Name	Function	Notes
Control - A	1	Shift lock	Toggles uppercase/lowercase	1,2
			keyboard input.	
Control - G	7	Bell	Speaker tone for 100 mS. Lower tone than the Apple's speaker.	
Control - H	8	Backspace	Cursor moves one space left.	2
Control - I	10	Line feed	Cursor down one line.	
Control - K	11	Clear EOS	Clears from cursor to end of screen.	1,3
Control - L	12	Clear	Homes cursor and clears screen.	1
Control - M	13	Return	Same as pressing RETURN key.	
Control - N	14	Normal	Sets the NORMAL display mode.	1
Control- O	15	Inverse	Sets the INVERSE display mode.	1
Control- S	19	Stop list	Stops listing until another key pressed.	2
Control - X	24	Clear line	Clears current line only.	2
Control - Y	25	Home	Homes cursor (Does not clear screen).	1
Control - \	28	Forward	Cursor moves one space right (Does not clear the character passed over).	4
Control -]	29	Clear EOL	Clears from cursor to end of line (Does not clear the character passed over).	4
Control - ^	30	GOTO XY	Uses next two characters, plus 32 as XY cursor coordinates.	1
Control - Z	26	Lead In code	Precedes one of the following numbers:	1
0	48	Initialize	Sets Viewmaster 80 defaults; clears screen.	
1	49	Quit	80 Column mode off.	
2	50	Normal Video	Same as NORMAL command.	
3	51	Inverse Video	Same as INVERSE command.	

1. Codes available only when Viewmaster 80 is active.
2. Codes will work only in the immediate mode (keyboard)
3. Codes will work only in the deferred mode (program)
4. No key to enter the code is available on the Apple II keyboard; must use `PRINT CHR$`

Display Control Commands

If you're not sure what the commands listed below do or how to use them, please refer to the Applesoft Tutorial or Applesoft Programmer's Reference Manual.

HOME - Regardless of whether the Viewmaster 80 is active or inactive, the HOME command will clear the screen to black and move the cursor to the upper left corner of the screen. If the HOME command is issued when the Viewmaster 80 is active and the display mode is INVERSE, the screen will still clear to a dark display, but subsequent characters will be inverse.

None of the other expansion-slot 80 column cards support the HOME command. Because of this, some compatibility problems may arise with existing BASIC software. This is not a problem unless the software uses a "Control-L" to clear the screen and home the cursor. Since the Viewmaster 80 supports both HOME and "Control-L," programs can be modified by replacing all instances of HOME with PRINT CHR$(12). In some cases, as with certain very early DOS 3.3 preboot disks, the HOME command itself must be disabled. This can easily be done by booting DOS 3.3 and running the following pre-preboot program:

```
10 PRINT CHR$(4);"PR#3": PRINT CHR$(12)
20 PRINT CHR$(26); CHRS (49)
30 POKE 1912,0
```

After running this program, insert the preboot disk and enter PR#6. The HOME command will now home the cursor, but it will not clear the screen. To reactivate the HOME command, use the same program, except POKE a "1" into location 1912.

INVERSE - Issuing this command from either the immediate or deferred mode will cause the Viewmaster 80 to switch to inverse text mode, displaying black characters against a white character block background, instead of the normal white characters on a black background. Only output to the screen is inverse; keyboard input is normal. Using the "Control-Z 3" command has the same effect as INVERSE, except that the keyboard input is also displayed inversely.

NORMAL - This command switches the inverse text mode back to the normal display. The "Control-Z 2" command will cancel the inverse text mode, but the NORMAL command will not cancel the effect of the "Control-Z 3" command.

FLASH - This command is not supported by the Viewmaster 80.

HTAB - This command was originally intended for use with a 40 column display only. Trying to HTAB beyond 40 columns will not work. To position the cursor anywhere on the 80 column line, use the POKE 36,n command ("n" is the column number between 0 and 79). The program statements shown below demonstrate the use of the HTAB command.

```
10 PRINT CHR$(12)
20 VTAB 10
30 POKE 36, 55: PRINT "APPLE II FOREVER! "
```

Cursor Positioning

Expansion-slot 80 column cards, including Viewmaster 80, do not support text windowing (POKE 34,T and POKE 35,B), but you can use the "Control-^ XY" cursor positioning command to emulate the windowing feature. Please refer to Table C-2 and the following BASIC program, which illustrates the use of this command.

```
10 PRINT CHR$(4);"PR#3"
20 INPUT "COLUMN COORDINATE: X = ";X:REM range 0 to 79
30 INPUT "LINE COORDINATE: Y = ";Y:REM range O to 23
40 PRINT CHR$(30); CHR$(X + 32); CHR$(Y + 32);
50 GOTO 20
```

The POS(0) command, used to return the cursor's current column position, can be emulated by the PEEK 1403 command. PEEK 1531 will return the cursor's current line number.

Custom Cursor Shape

Upon initialization, the Viewmaster 80 cursor defaults to a solid, slowly blinking rectangular shape. Both the cursor's blink rate and its vertical size and position can be controlled from within a BASIC program. This example program shows how the cursor shape and blink rate can be altered.

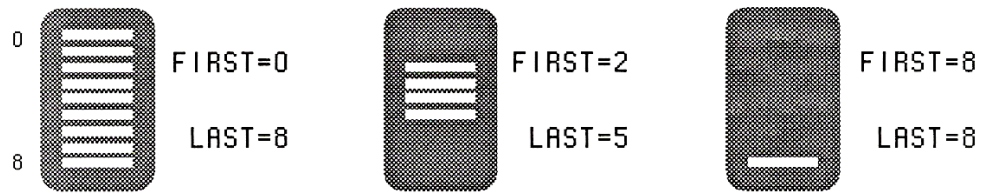
```
10 PRINT CHR$(4);"PR#3"
20 VM = 49328
30 BLINK = 0
40 FIRST = 2
50 LAST = 5
60 POKE VM,10
70 POKE VM + 1,BLINK + FIRST
80 POKE VM, 11
90 POKE VM + 1, LAST
99 END
```

Remember: This program only modifies the Viewmaster 80 cursor. The 40 column cursor is generated by the computer and is merely "passed through" the Viewmaster 80 (Statement 10 of the program ensures the Viewmaster 80 is activated).

The Viewmaster 80 cursor is actually made up of 9 rows of horizontal lines. These rows are numbered 0 through 8, starting at the top. Statements 40 and 50 in the example program determine the beginning (FIRST) and ending (LAST) rows to be displayed. In the program example shown, the cursor becomes a small square block, consisting of rows 2 through 5. Rows 0, 1, 6, 7, and 8 are blank. This is illustrated in the picture following.

The Viewmaster 80 cursor blink rate can be varied from steady to fast, or turned off entirely by changing the "BLINK =" value in statement 30. The allowable values and their functions are:

BLINK = 0	Steady; non-blinking cursor
BLINK = 32	Cursor OFF
BLINK = 64	Fast blinking cursor
BLINK = 96	Normal blinking cursor



Example Cursors

ViewMaster 80 Graphics Display

When the Viewmaster 80 is active, the 80 column text display is generated by the Viewmaster 80, not by the Apple's 40 column video circuitry. But the graphics displays, accessed via the GR, HGR, and HGR2 commands, are generated by the Apple and must be passed through the Viewmaster 80. In 40 column mode this is done automatically. In Viewmaster 80 mode, all graphics display routines must be preceded with a POKE 49330,0 to flip the graphics display soft switch on the Viewmaster 80, allowing the graphics to pass through. Any subsequent character output to the Viewmaster 80 will automatically flip the soft switch back to 80 column text mode.

The Automatic Graphics Override modification, described in Appendix B, will enable the Viewmaster 80 to switch to graphics display mode without the POKE 49330,0 command. Some older programs, which combine the use of 80 column text and graphics, may not be able to switch to graphics mode correctly. This override modification should solve the problem and should not interfere with the more recent software.

To switch from text to the high resolution (Hi-Res) screen while in the Pascal environment, a special firmware location on the Viewmaster 80 must be accessed. This is accomplished by including the following lines in your Pascal program:

```
var
  hires : integer ; (* any hires variable of type
integer *)
function PEEK (address : integer): integer;
type  byte = 0..255;

var
  memref : record case integer of
    1 : (addr : integer);
    2 : (ptr : ^byte);
    end;

begin
  memref.addr :=address;
  PEEK := memref.ptr^ div 256;
end;  (* function PEEK *)
```

To turn on the Hi-Res display, execute this line:

```
hires :=PEEK (-16206);
```

The high resolution display will remain active until a character is printed to the text screen. The d isplay will then switch to the text display until the next PEEK(-16206) command is executed.

Hardware Control of Viewmaster 80

40 Column Override

There are four holes on the Viewmaster 80 card located between the two video jacks. If the two upper holes, marked "40 CO" and “GND" are shorted together, the Viewmaster 80 will switch to 40 column mode, ignoring any software commands to activate the Viewmaster 80’s firmware. This feature essentially disables the Viewmaster 80. A remote toggle switch (Single Pole, Single Throw) can be wired to these points.

Light Pen Support

The largest integrated circuit chip on the Viewmaster 80 is a very sophisticated device, called a CRT Controller (CRT stands for Cathode Ray Tube). This chip, which is actually the heart of the Viewmaster 80's video display circuitry, is capable of supporting compatible light pens. The lower two holes of the four holes between the Viewmaster 80 video jacks provide access to the light pen feature. These holes are marked "L.PEN" and "+5V".

Before you purchase a light pen, check with the light pen manufacturer to make sure that it is compatible with the Viewmaster 80 and that there is software to support it. The light pen should be capable of providing a low-going pulse of at least 1 μsec duration whenever it senses a "hit" on the video screen. The response time of the lightpen should be faster than 500 nanoseconds if it is to respond with one character position on the screen. The light pen must also be capable of sinking 2 mA.

APPENDIX D

A Brief ProDOS Tutorial

This is a brief explanation of the **Pro**fessional **D**isk **O**perating **S**ystem, **ProDOS**, for those who are completely new to it. All of this information and more is included in your *Apple Owner's Guide*, but we have provided it here for your convenience.

Operating System

ProDOS is one of several operating systems for the Apple. Others include DOS 3.3 and Pascal. Operating systems, as defined in the *Apple Owner's Guides*, are programs that control how information is loaded into memory, how the computer handles the information, how the information is stored on a disk, and how the computer communicates with the printer and other peripherals.

Naming Volumes

ProDOS must have a way to locate which disk (often called "volume") you want to access. Instead of typing in the location of the disk as in DOS 3.3 (ex: S6,D1), you simply type in the name of the disk (the volume name). Some rules for volume names are:

1. Name can include letters, numbers, or periods but not spaces
2. Name must begin with a letter
3. Name can be up to 15 characters long

These rules also hold true for subdirectory names.

Root Directory and Subdirectory

The main directory of the volume is called the root directory. The root directory uses the same name as your disk. Subdirectories are ProDOS' way of organizing information on a disk.

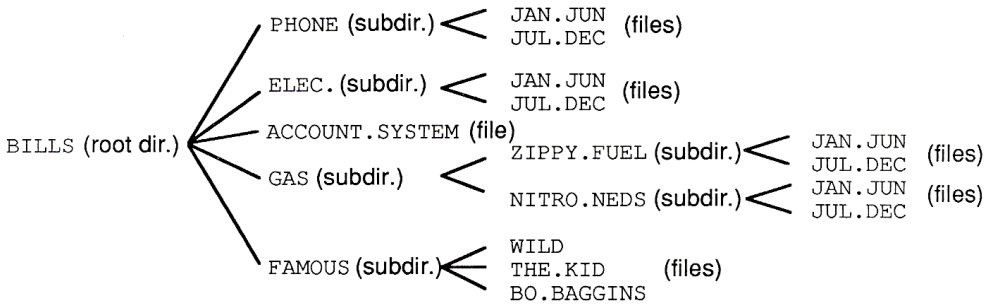
Think of the root directory as a file drawer and the subdirectories as folders within the drawer. You can

1. Put files directly into the root directory like putting documents straight into the file drawer

2. Put files within subdirectories like putting documents in folders
3. Put subdirectories within subdirectories like putting folders within folders.

Pathname

The name of the directory combined with the names of one or more subdirectories is called a pathname. Volume names and subdirectory names are preceded by a slash, "/" (Note that some applications add the slash for you). For example, you could have a volume named `/MY.DISK` and a file called `MY.FILE` on the root directory of that disk. To access that file, you would use the pathname `/MY.DISK/MY.FILE`. You could also have a file `JUL.DEC` in a subdirectory (folder) called `PHONE` on a disk called `/BILLS`. To access that file, you would use the pathname `/BILLS/PHONE/JUL.DEC`. Refer to the diagram below:



ProDOS Directory Structure

Now when an application asks you for the pathname of a file, you'll have a basic understanding of what it expects.

System Files

A system file is a ProDOS file that starts an application. Typically, these files have the suffix `.SYSTEM` (e.g. `/APLWORKS.SYSTEM`, `/ACCOUNT.SYSTEM` [see above], etc.). When you boot ProDOS, it runs the first system file listed in its directory. So, if BASIC.SYSTEM is the first system file on your ProDOS boot disk, ProDOS will boot and then put you in BASIC.

Additional Resources

The following books are available through most book stores:

Apple II Owner's Manual (Apple Computer, Inc.) Supplied with your Apple Computer. Take the time to read it.

Basic Programming with ProDOS (Addison-Wesley Publishing) Gives a detailed explanation of how to use ProDOS from AppleSoft Basic.

Beneath Apple ProDOS (Quality Software) Provides information about ProDOS for both the novice Apple user and the advanced programmer.

ProDOS Inside and Out (TAB Books) Very good book for both the beginning and advanced BASIC Programmer.

ProDOS User's Manual (Apple Computer, Inc.) Provides an overview of ProDOS and explains how to use the ProDOS User's Disk.

APPENDIX E

Getting Help

If you have a technical question relating to your Viewmaster 80 card or any other Æ card that is not covered in the manual, please contact the dealer from whom you purchased the card. If you are experiencing difficulties with one particular program, contact the program's author or publisher.

In the event that the dealer or the publisher's support personnel cannot answer your question, call Applied Engineering Technical Support. The support representatives are experienced in the applications and uses of Applied Engineering products, but in order to provide a quick and effective answer to your question, they will need to know as much as possible about the hardware and software specifically related to your question. Please provide the technical support representative with the following information:

- ♢ The Applied Engineering product related to your question and its revision number.t
- ♢ The original and current memory configuration of the card (if applicable).
- ♢ The model and revision of your computer.
- ♢ What peripherals are being used and what cards are in each slot.
- ♢ The name, version, and revision level of the software with which you are experiencing problems.
- ♢ The results of any test programs, diagnostics, or troubleshooting done by you, your dealer, or your software publisher's support department.

Applied Engineering
Technical Support
(214) 241-6069
9 AM to 12:30 PM & 1:35 PM to 5 PM(CST)
Monday Through Friday

(Please call only the number above for technical support. Our sales office cannot transfer calls to the support lines)

Returning a Product

Include

If your product needs to be returned, the technical support representative will give you a Return Material Authorization (RMA) number.

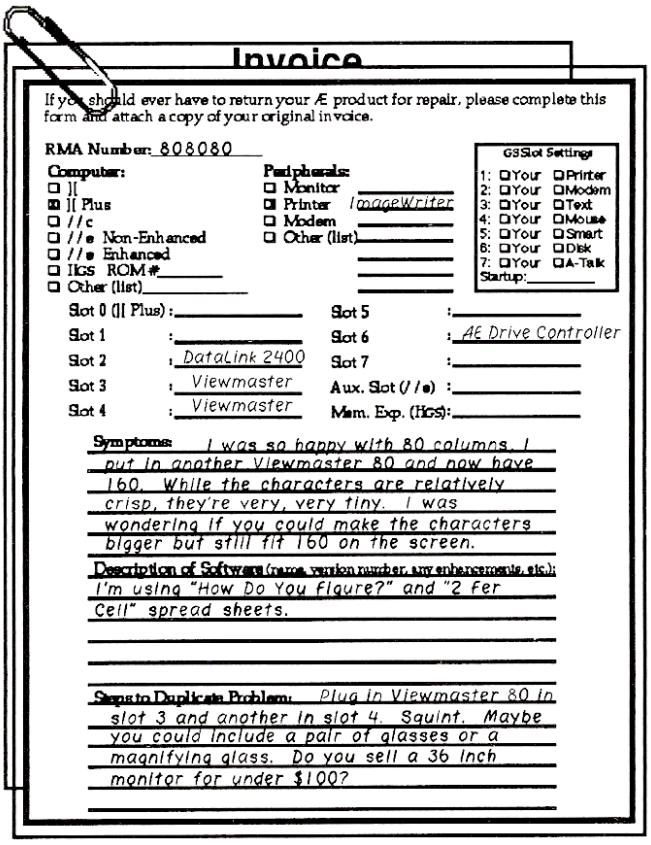
- ❑ Record the RMA number for your own records.
- ❑ Write the RMA number on the outside of the package you send to us.
- ❑ Write the RMA number at the top of the return form included with your product package.

Fill out the Return Form on back of the yellow sheet marked "Attention!" A correctly completed form will greatly reduce the time it takes to process and return your product.

Attach a copy of your original invoice to the return form.

- ❖ **Warning:** If you don't include an invoice, products will be treated as out of warranty products and will be returned to you C.O.D. for the amount of the service charge.

A completed form should look something like the one below.



Invoice

If you should ever have to return your Æ product for repair, please complete this form and attach a copy of your original invoice.

RMA Number: 808080

Computer:
- ❑][
- ☒][Plus
- ❑ //c
- ❑ //e Non-Enhanced
- ❑ //e Enhanced
- ❑ IIGS ROM #_____
- ❑ Other (list)_____

Peripherals:
- ❑ Monitor _____
- ☒ Printer ImageWriter
- ❑ Modem _____
- ❑ Other (list)_____

GS Slot Settings

1:	❑ Your	❑ Printer
2:	❑ Your	❑ Modem
3:	❑ Your	❑ Text
4:	❑ Your	❑ Mouse
5:	❑ Your	❑ Smart
6:	❑ Your	❑ Disk
7:	❑ Your	❑ A-Talk

Startup: _____

Slot 0 (][Plus)	:	Slot 5	:
Slot 1	:	Slot 6	: Æ Drive Controller
Slot 2	: DataLink 2400	Slot 7	:
Slot 3	: Viewmaster	Aux. Slot (// e)	:
Slot 4	: Viewmaster	Mem. Exp. (IIGS):	

Symptoms: I was so happy with 80 columns. I put in another Viewmaster 80 and now have 160. While the characters are relatively crisp, they're very, very tiny. I was wondering if you could make the characters bigger but still fit 160 on the screen.

Description of Software (name, version number, any enhancements, etc.): I'm using "How Do You Figure?" and "2 Fer Cell" spread sheets.

Steps to Duplicate Problem: Plug in Viewmaster 80 in slot 3 and another in slot 4. Squint. Maybe you could include a pair of glasses or a magnifying glass. Do you sell a 36 inch monitor for under $100?

When You Ship

If you don't have the original packing material, wrap the board in anti-static material (preferably the anti-static bag in which the card was originally shipped; however, aluminum foil will work fine). Pack it in a sturdy box cushioned with wadded papers (i.e. used computer paper or newspaper).

- **Warning:** If your product is damaged due to inadequate packing, your warranty will be void.

Include the return form and invoice.

Send the package, shipping prepaid, to:

RMA#_ _ ? _ _
Applied Engineering
Technical Support
3210 Belt Line Road, Suite 154
Dallas TX 75234

You should insure your package. Æ will not assume any responsibility for inadequate packing or loss or damage during shipping.

When We Receive

Our service department will use your completed form in an attempt to duplicate the problem.

If it is determined that your product is defective due to a manufacturing defect, your card will be repaired or replaced at Æ's option.

Any misuse, abuse, or non-Æ authorized alteration, modification, and/or repair to the Applied Engineering product will void the warranty. This warranty will also be void if you use the Æ product for any purpose other than its intended use.

Your product will be fully tested before it is shipped back to you, transportation prepaid, via UPS regular delivery.

Once your product is received by Technical Support, it will be processed and delivered to our shipping department within 7 to 10 working days.